MXI™

NI ExpressCard MXI Series User Manual

NI ExpressCard MXI Multisystem eXtension Interface for ExpressCard™, CompactPCI, and PXI Bus (including PXI Express) Systems

NI PXI-ExpressCard 8360/NI PXIe-ExpressCard 8360, NI ExpressCard-8360, NI PXI-8360, and NI PXIe-8360

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NATIONAL INSTRUMENTS™

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About This Manual

This manual describes the features, functions, and operation of the NI ExpressCard MXI series of products. The products in this series are the NI PXI-ExpressCard 8360, NI PXIe-ExpressCard 8360, NI ExpressCard-8360, NI PXI-8360, and the NI PXIe-8360.

Conventions

The following conventions appear in this manual:

»	The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.
	This icon denotes a note, which alerts you to important information.
	This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.
bold	Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.
cPCI/cPCIe	The terms *cPCI* and *cPCIe* refers to CompactPCI and CompactPCI Express, respectively.
italic	Italic text denotes variables, emphasis, a cross-reference, or an introduction to a key concept. Italic text also denotes text that is a placeholder for a word or value that you must supply.
`monospace`	Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames, and extensions.
NI PXI-ExpressCard 8360	NI PXI-ExpressCard 8360 refers to a kit containing an NI ExpressCard-8360, an NI PXI-8360, and a cable.
NI PXIe-ExpressCard 8360	NI PXIe-ExpressCard 8360 refers to a kit containing an NI ExpressCard-8360, an NI PXIe-8360, and a cable.

NI ExpressCard MXI board	NI ExpressCard MXI board refers to either of the following boards, unless otherwise noted: NI ExpressCard-8360 and NI PXI-8360.
PXIe	The term *PXIe* refers to PXI Express.

Note In this manual, whenever a PXI chassis is referenced, a CompactPCI chassis could be used instead.

Related Documentation

The following documents contain information that you might find helpful as you read this manual:

- *Set Up Your NI ExpressCard MXI System*
- Your computer or chassis documentation
- *PXI Hardware Specification*, Revision 2.1
- *PXI Software Specification*, Revision 2.1
- *PCI Specification*, Revision 2.3
- *PCI-PCI Bridge Architecture Specification*, Revision 1.1
- *PICMG CompactPCI 2.0 R3.0* specification
- *PICMG EXP.0 CompactPCI Express Specification R1.0*
- *PCMCIA ExpressCard Standard*, Revision 1.0
- *PCI Express Base Specification*, Revision 1.1
- *PXI-5 PXI Express Hardware Specification*, Revision 1.0, PXI Systems Alliance
- *PXI-6 PXI Express Software Specification*, Revision 1.0, PXI Systems Alliance

1

Introduction

This chapter describes the NI ExpressCard MXI series of products, lists what you need to get started, and explains how to unpack and set up your hardware.

The products in this series are the NI ExpressCard-8360, NI PXIe-8360, and NI PXI-8360. For the remainder of this manual, the term *NI ExpressCard MXI board* refers to any product in the NI ExpressCard MXI series.

NI ExpressCard MXI boards must always be installed as an ExpressCard board and a PXI board.

Note The terms *PXIe*, *cPCI*, and *cPCIe* refer to PXI Express, CompactPCI, and CompactPCI Express, respectively.

About the NI ExpressCard MXI Series

Description and Features

NI ExpressCard MXI functions as a cabled PCI Express link of up to 7 m and a PCI Express-to-PCI bridge or switch. With NI ExpressCard MXI, you can do the following:

- Control a PXI/cPCI or PXIe/cPCIe chassis with a laptop PC
- Control a second PXI/cPCI or PXIe/cPCIe chassis with a PXI/cPCI or PXIe/cPCIe controller, such as the NI PXI-8196 or NI PXIe-8103

Basic NI ExpressCard MXI System

An NI ExpressCard MXI system consists of an NI ExpressCard-8360 in a laptop PC connected to an NI PXI-8360 or NI PXIe-8360 in the controller slot of a PXI/cPCI or PXIe/cPCIe chassis respectively, as shown in Figure 1-1.

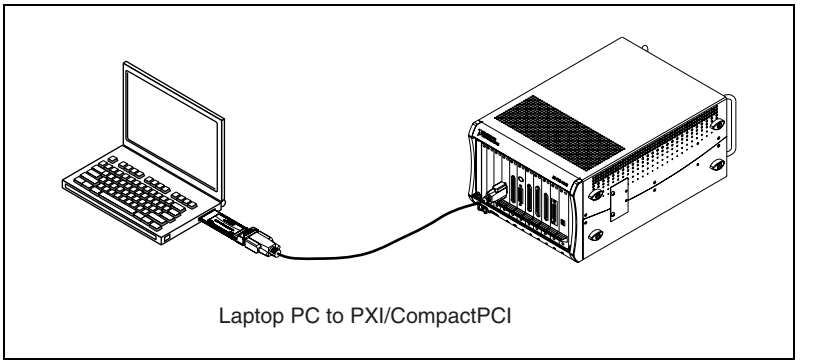


Figure 1-1. Basic NI ExpressCard MXI Configuration

What You Need to Get Started

To set up and use your NI ExpressCard MXI boards, you need the following:

- ❑ One NI ExpressCard-8360 and one NI PXI-8360 or NI PXIe-8360
- ❑ A MXI-Express/ExpressCard MXI cable
- ❑ A laptop PC or other host with an available ExpressCard slot
- ❑ An expansion chassis—the PXI/cPCI or PXI Express/CompactPCI Express chassis that you control with NI ExpressCard MXI

Note Your NI PXI-8360 board will work in any standard CompactPCI chassis adhering to the *PICMG CompactPCI 2.0 R3.0* specification, or in PXI chassis that are compatible with the *PXI Hardware Specification*, Revision 1.0 or later. Your NI PXIe-8360 board will work in a PXI Express or CompactPCI Express chassis that is compatible with the *PXI-5 PXI Express Hardware Specification*, Revision 1.0, or the *PICMG EXP.0 CompactPCI Express Specification R1.0*. Your NI ExpressCard MXI board will work in many systems compliant with the *PCMCIA ExpressCard Standard*, Revision 1.0 or later.

Note Some laptops do not expect bridges behind an ExpressCard module, and they will not configure the PXI/cPCI system correctly. Refer to the *Related Links* section of KnowledgeBase 3U7CI4D8 for a link to a list of compatible laptops.

Unpacking

Your NI ExpressCard MXI boards are shipped in antistatic packages to prevent electrostatic damage (ESD) to the devices. ESD can damage several components on the device.

Caution *Never* touch the exposed pins of connectors. Doing so may damage the device.

To avoid such damage in handling the device, take the following precautions:

- Ground yourself using a grounding strap or by holding a grounded object.
- Touch the antistatic package to a metal part of the computer chassis before removing the device from the package.

Remove the device from the package and inspect the device for loose components or any sign of damage. Notify NI if the device appears damaged in any way. Do *not* install a damaged device into the computer, PXI/cPCI, or PXIe/cPCIe chassis.

Store the device in the antistatic envelope when not in use.

2

Hardware Installation

This chapter explains how to install the NI ExpressCard™ MXI hardware.

Hardware Installation

The following are general instructions for installing the NI ExpressCard MXI boards. Consult your computer user manual or technical reference manual for specific instructions and warnings.

Note The PXI Platform Services software on the *PXI Platform Services* CD or driver CD included with your hardware is required to provide chassis and controller identification for PXI features such as trigger routing and slot detection. The PXI Platform Services software is also included with the NI-DAQmx and NI-VISA drivers. For more information, refer to KnowledgeBase 3TJDOND8 at `ni.com`.

Installing an NI PXI-8360 or NI PXIe-8360

Complete the following steps to install the NI PXI-8360 or NI PXIe-8360 in your PXI/cPCI or PXIe/cPCIe chassis.

1. Power off your PXI/cPCI or PXIe/cPCIe chassis, but leave it plugged in while installing the NI PXI-8360 or NI PXIe-8360. The power cord grounds the chassis and protects it from electrical damage while you install the module.

Caution To protect both yourself and the chassis from electrical hazards, leave the chassis off until you finish installing the NI PXI-8360 or NI PXIe-8360.

Note The NI PXI-8360 or NI PXIe-8360 must be installed in the controller slot (slot 1 in PXI).

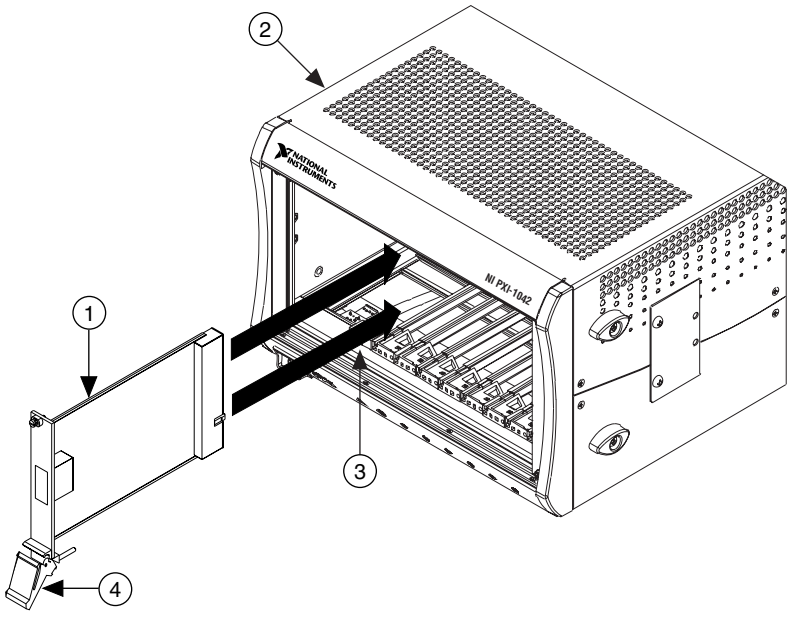
2. Remove or open any doors or covers blocking access to the controller slot in which you intend to install the NI PXI-8360 or NI PXIe-8360.
3. Touch the metal part of the case to discharge any static electricity that might be on your clothes or body.

4. Make sure the injector/ejector handle is in its downward position. Be sure to remove all connector packaging and protective caps from retaining screws on the module. Align the NI PXI-8360 or NI PXIe-8360 with the card guides on the top and bottom of the system controller slot.

Caution Do *not* raise the injector/ejector handle as you insert the NI PXI-8360 or NI PXIe-8360. It will not insert properly unless the handle is in its downward position so that it does not interfere with the injector/ejector rail on the chassis, as shown in Figure 2-2.

5. Hold the handle as you slowly slide the module into the chassis until the handle catches on the injector/ejector rail.
6. Raise the injector/ejector handle until the module firmly seats into the backplane receptacle connectors. The front panel of the NI PXI-8360 or NI PXIe-8360 should be even with the front panel of the chassis.
7. Tighten the bracket-retaining screws on the top and bottom of the front panel to secure the NI PXI-8360 or NI PXIe-8360 to the chassis.
8. Replace or close any doors or covers to the chassis.

Figure 2-2 shows an NI PXI-8360 or NI PXIe-8360 just before installation in the system controller slot of a National Instruments chassis.



1	NI PXI-8360 or NI PXIe-8360	3	PXI/cPCI or PXIe/cPCIe Slot 1
2	PXI/cPCI or PXI Express/CompactPCI Express Chassis	4	Ejector Handle in Down Position

Figure 2-1. NI PXI-8360 or NI PXIe-8360 Board Before Installation

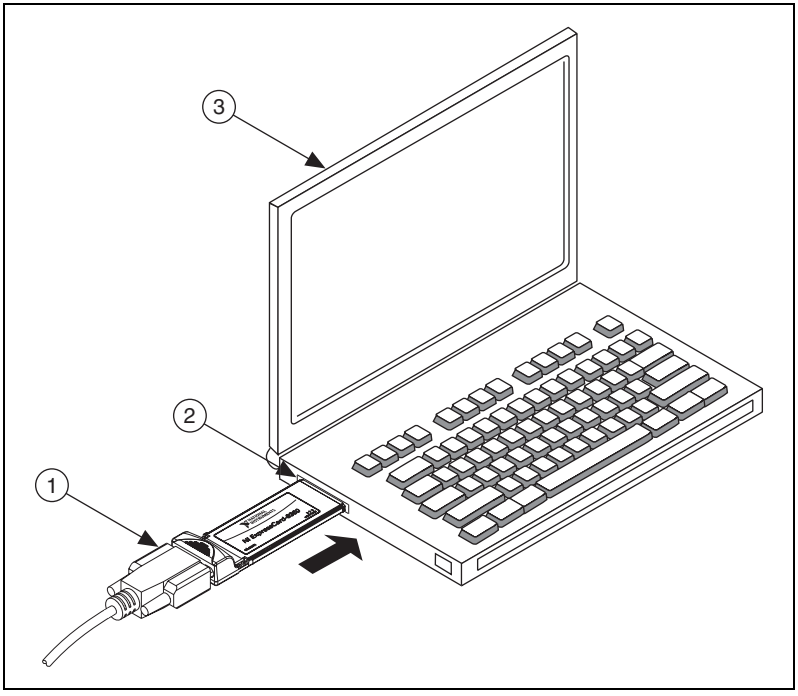
Installing an NI ExpressCard-8360

Because a laptop is not grounded, follow this procedure to safely connect it to your PXI system:

1. Install the NI PXI-8360 or NI PXIe-8360 as directed in the previous section.
2. Touch the NI ExpressCard-8360 and a metal part of the PXI chassis simultaneously.
3. Connect the cable to the NI PXI-8360 or NI PXIe-8360 and NI ExpressCard-8360.
4. Plug the NI ExpressCard-8360 into an available ExpressCard slot.

If your computer is already running (or hibernating, etc.) when you install NI ExpressCard MXI, you must reboot to detect the PXI system. Otherwise, the PXI system is detected when you start your computer.

Figure 2-2 shows how to insert the NI ExpressCard-8360 and connect the cable.



1 MXI-Express Cable 2 ExpressCard Slot 3 Portable Computer

Figure 2-2. Installing the NI ExpressCard-8360

Cabling

The NI ExpressCard MXI interface uses the same cable as MXI-Express and MXI-Express for PXI Express. The cables have no polarity, so either end may be connected to either board.

Caution Do *not* remove the cable after the system is powered on. Doing so can hang or cause errors in applications communicating with devices behind NI ExpressCard MXI. If a cable becomes unplugged, plug it back into the system.

Notes For more information about cables, refer to the *NI ExpressCard MXI Cable Options* section of Chapter 3, *Hardware Overview*.

You cannot use two NI PXI-8360 or NI PXIe-8360 boards for chassis expansion as with MXI-4. You can connect only an NI PCIe-8361/8362 or an NI ExpressCard-8360 host device to an NI PXI-8360 or NI PXIe-8360.

Powering Up the NI ExpressCard MXI System

To power up the NI ExpressCard MXI system, follow these steps:

1. Power on the expansion chassis.
2. Power on the host.

Typical PCI-PCI bridges are used to add PCI devices to a PCI hierarchy in which all the bridges and devices are contained within a single chassis. Because of this, BIOSes and operating systems make the assumption that all PCI devices in the entire hierarchy will be available as soon as code execution begins at power-up. This assumption means that all of the expansion chassis must be turned on before the host PC for the BIOS and OS to correctly configure an NI ExpressCard MXI system.

Note You may add additional chassis using MXI-3 or MXI-4. When using MXI-4, there are no restrictions on chassis power-on order, except that the host must be powered on last. When using MXI-3, you must power up the chassis in order, beginning furthest from the host and ending with the host. Refer to the MXI-3 or MXI-4 documentation for further details.

Powering Down the NI ExpressCard MXI System

Because operating systems and drivers commonly make the assumption that PCI devices will be present in the system from power-up to power-down, it is important not to power off the expansion chassis until after the host PC is powered off. Powering off the expansion chassis while the host is still on can cause crashes or hangs. The order in which expansion chassis are powered off, relative to each other, is not important.

3

Hardware Overview

This chapter presents an overview of NI ExpressCard MXI hardware functionality and explains the operation of each functional unit.

Functional Overview

NI ExpressCard MXI is based on PCI Express technology. An NI ExpressCard MXI kit uses standard PCI Express bridges or switches. The architecture is transparent to device drivers, so no additional software is needed to support NI ExpressCard MXI.

No software is required for basic functionality. SMBus and ID device both require drivers.

Note The PXI Platform Services software on the *PXI Platform Services* CD or driver CD included with your PXI Express MXI-Express hardware is required to provide chassis and controller identification for PXI features such as trigger routing and slot detection. The PXI Platform Services software is also included with the NI-DAQmx and NI-VISA drivers. For more information, refer to KnowledgeBase 3TJDONDS at `ni.com`.

The link between the PC and the chassis is a x1 PCI Express link. This link is a dual-simplex communication channel comprised of a low-voltage, differentially driven signal pair. The link can transmit at a rate of 2.5 Gbps in each direction simultaneously. This connector is not compatible with the cabled PCI Express specification to be released by the PCI-SIG in the next few months.

Figure 3-1 shows the basic architecture of NI ExpressCard MXI with an NI PXI-8360. Figure 3-2 shows the basic architecture of NI ExpressCard MXI with an NI PXIe-8360. The NI ExpressCard-8360 consists of an ExpressCard module connector, a PCI Express cable driver, and one high-speed cable connector. The NI PXI-8360 consists of one high-speed cable connector, a PCI Express-to-PCI bridge, and a PXI connector. The NI PXIe-8360 consists of one high-speed cable connector, a PCI Express-to-PCI Express switch, and a PXIe connector.

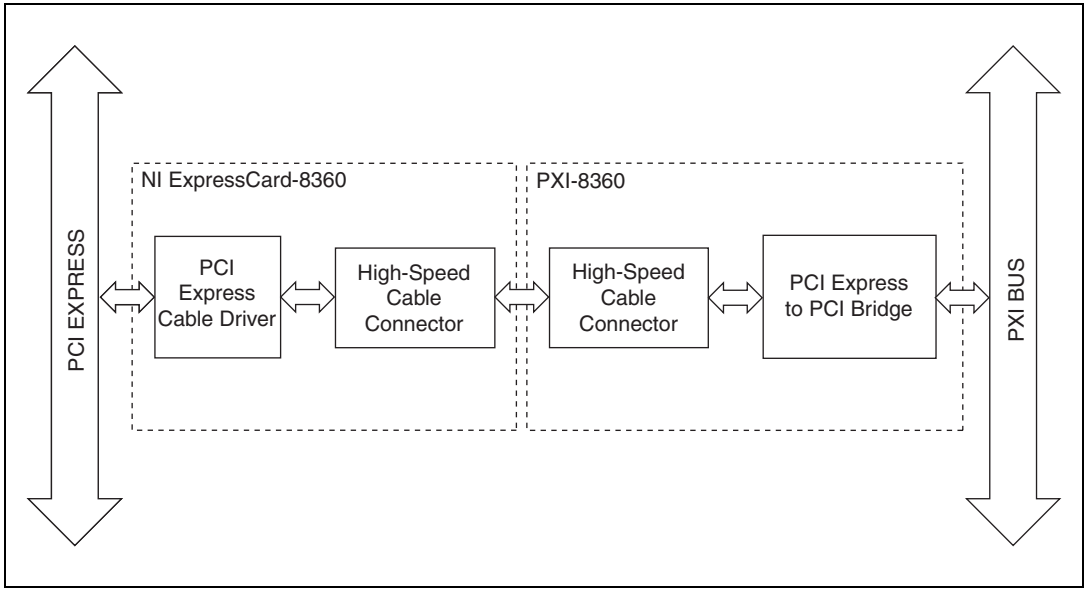


Figure 3-1. NI ExpressCard MXI Block Diagram with NI PXI-8360

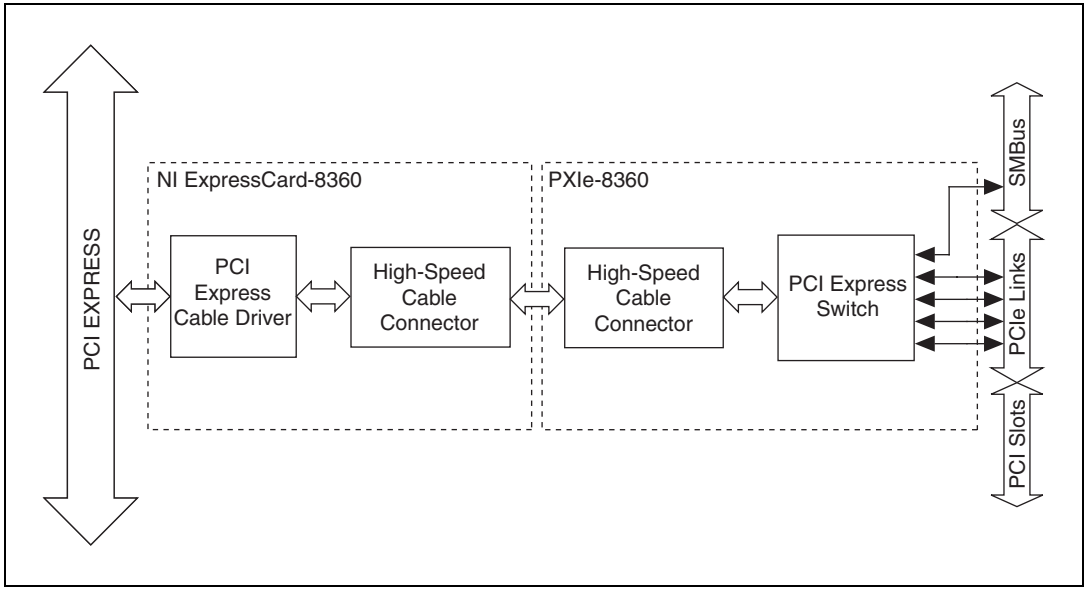


Figure 3-2. NI ExpressCard MXI Block Diagram with NI PXIe-8360

Functional Unit Descriptions

PCI Express x1 Cable Driver

This PCI Express device consists of one upstream and one downstream PCI Express physical interface. It buffers the PCI Express signals and drives them onto the cable.

High-Speed Cable Connector

The high-speed cable connector provides all necessary signals to connect an NI ExpressCard-8360 and an NI PXI-8360 or NI PXIe-8360. These signals include the PCI Express transmit and receive pair, the system clock, a reset, and a presence-detect signal.

PCI Express-to-PCI bridge

The *PCI Express Base Specification* defines a PCI Express-to-PCI bridge as a device that connects a PCI Express fabric and a PCI hierarchy. On the NI PXI-8360, the PCI Express-to-PCI bridge connects the x1 PCI Express link and the PCI bus in a PXI or CompactPCI chassis. A bridge on a PXI Express backplane (not shown) connects the PCI Express link to the PXI and hybrid slots.

PCI Express-to-PCI Express Switch

The *PCI Express Base Specification* defines a PCIe switch as a logical collection of PCIe-to-PCIe bridges. For the NI PXIe-8360 the PCIe switch fans out the front panel x1 PCIe link to four x4 PCIe links in the PXIe chassis.

LED Indicators

The LEDs on the NI PXI-8360 and the NI PXIe-8360 provide status information about power supplies and link state. The NI PXI-8360 and NI PXIe-8360 have two LEDs, one for power supply status and one for link state.

Table 3-1 provides the status descriptions for the LEDs on the NI PXI-8360 and NI PXIe-8360.

Table 3-1. LED Status Descriptions for NI PXI-8360 and NI PXIe-8360

LED	Color	Meaning
PWR	Off	No power
	Red	Power is out of spec
	Green	Power is within spec
LINK	Off	Link not established
	Green	Link established

The NI PXIe-8360 has some additional LEDs on the back side of the board near the front-panel connector. These LEDs give additional information about the link status of the PCI Express lanes on the module to the backplane. For more information, refer to KnowledgeBase 3U7CDCD8 at `ni.com`.

NI ExpressCard MXI Cable Options

NI ExpressCard MXI is available with cables of three lengths. Table 3-2 shows the cables available from National Instruments.

Table 3-2. NI ExpressCard MXI Cables

Cable Length (Meters)	Description
1 m	NI ExpressCard MXI copper cable (part number 779500-01)
3 m	NI ExpressCard MXI copper cable (part number 779500-03)
7 m	NI ExpressCard MXI copper cable (part number 779500-07)

A

Specifications

This appendix lists the system specifications for NI ExpressCard-8360, NI PXI-8360, and NI PXIe8360 boards.

NI PXI-8360

Physical

NI PXI-8360

Dimensions..... 10.0 × 16.0 cm (3.9 × 6.3 in.)

Maximum cable length..... 7 m

Slot requirements ..... One controller slot

Compatibility ..... Fully compatible with the *PXI Hardware Specification*, Revision 2.1

Weight..... 0.150 kg (0.33 lb) typical

Power requirements

Power Rail	Typical Current	Maximum Current
+3.3 V	1.500 A	1.750 A
+5 V	5 mA	20 mA
+12 V	5 mA	20 mA
–12 V	0 mA	0 mA

Environment[1]

Maximum altitude.....2,000 m (at 25 °C ambient temperature)

Pollution Degree 2

Indoor use only

Operating Environment

Ambient temperature range .....0 to 55 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Relative humidity range.....10 to 90%, noncondensing (Tested in accordance with IEC-60068-2-56.)

Storage Environment

Ambient temperature range .....–40 to 70 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Relative humidity range.....5 to 95%, noncondensing (Tested in accordance with IEC-60068-2-56.)

Shock and Vibration

Operational shock .....30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC-60068-2-27. Test profile developed in accordance with MIL-PRF-28800F.)

[1] Specifications are subject to change without notice.

Random Vibration

Operating ..... 5 to 500 Hz, 0.3 g_{rms}

Nonoperating ..... 5 to 500 Hz, 2.4 g_{rms} (Tested in accordance with IEC-60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

NI PXIe-8360

Physical

NI PXIe-8360

Dimensions..... 10.0 × 16.0 cm (3.9 × 6.3 in.)

Maximum cable length..... 7 m

Slot requirements ..... One controller slot

Compatibility ..... Fully compatible with the *PXI-5 PXI Express Hardware Specification*, Revision 1.0

Weight..... 0.170 kg (0.37 lb) typical

Power requirements

Power Rail	Typical Current	Maximum Current
+3.3 V	2.5 A	3 A
+5 V	0 mA	0 mA
+12 V	0 mA	0 mA
+5 V_{aux}	0.3 A	0.4 A

Environment[1]

Maximum altitude.....2,000 m (800 mbars)
(at 25 °C ambient temperature)

Pollution Degree 2

Indoor use only

Operating Environment

Ambient temperature range .....0 to 55 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 low temperature limit and MIL-PRF-28800F Class 2 high temperature limit.)

Relative humidity range.....10 to 90%, noncondensing (Tested in accordance with IEC-60068-2-56.)

Storage Environment

Ambient temperature range .....–40 to 71 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 limits.)

Relative humidity range.....5 to 95%, noncondensing (Tested in accordance with IEC-60068-2-56.)

Shock and Vibration

Operational shock .....30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC-60068-2-27. Meets MIL-PRF-28800F Class 2 limits.)

Random Vibration Operating .....5 to 500 Hz, 0.3 g_{rms}

[1] Specifications are subject to change without notice.

Nonoperating ..... 5 to 500 Hz, 2.4 g_{rms}
(Tested in accordance with IEC-60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

NI ExpressCard-8360

Physical

Dimensions..... 10.2 × 3.4 cm
(4.0 × 1.3 in.)

Maximum cable length..... 7 m

Slot requirements ..... One 34 mm or 54 mm slot (ExpressCard)

Compatibility ..... Fully compatible with the *PXI Hardware Specification*, Revision 2.1

Weight..... 29 g (0.063 lb) typical

Power requirements

Power Rail	Typical Current	Maximum Current
+3.3 V	360 mA	450 mA
+3.3 V Aux	1 mA	10 mA
+1.5 V	0	0

Environment[1]

Maximum altitude.....2,000 m (at 25 °C ambient temperature)

Pollution Degree.....2

Indoor use only

Operating Environment

Module ambient temperature range.....0 to 65 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Operating relative humidity.....5 to 95%, noncondensing (Tested in accordance with IEC-60068-2-56.)

Storage Environment

Ambient temperature range.....–20 to 65 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Nonoperating thermal shock.....–20 to 65 °C, 5 shocks

Shock and Vibration

Nonoperating shock.....50 g, 11 ms (Tested in accordance with IEC 60068-2-27.)

Nonoperating vibration, sinusoidal.....15 g 100 to 2000 Hz (Tested in accordance with IEC 60068-2-6.)

Nonoperating drop test.....2 drops in 3 mutually exclusive axes from 75 cm onto no-cushioning vinyl tile surface

[1] Specifications are subject to change without notice.

Cleaning

If you need to clean the module, use a soft, nonmetallic brush. Make sure that the module is completely dry and free from contaminants before returning it to service.

Common Specs

Safety

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

Note For UL and other safety certifications, refer to the product label, or visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Electromagnetic Compatibility

This product is designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 61326 EMC requirements; Minimum Immunity[1]
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A

Note For EMC compliance, operate this device according to printed documentation.

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

[1] In the presence of ESD or surge events, the link may fail. If this happens, the user should reboot the host computer.

Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at `ni.com/environment`. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit `ni.com/environment/weee.htm`.

电子信息产品污染控制管理办法 （中国 RoHS）

中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 `ni.com/environment/rohs_china`。(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

B

Common Questions

This appendix lists common questions related to the use of the NI ExpressCard MXI controllers.

General Hardware

What are the board names of the NI ExpressCard MXI remote controllers?

- NI ExpressCard-8360: ExpressCard MXI Interface
- NI PXI-8360: MXI Express Interface
- NI PXIe-8360: MXI Express for PXI Express Interface

Is NI ExpressCard MXI compatible with NI MXI Express?

NI ExpressCard MXI and NI MXI Express use the same cable and PXI/cPCI module (the NI PXI-8360). You can use either an NI ExpressCard-8360 or an NI PCIe-8361/8362 to control a chassis with an NI PXI-8360 or NI PXIe-8360.

How many PXI bus segments can I connect together with NI ExpressCard MXI?

The PCI specification allows up to 255 bus segments. NI ExpressCard MXI does not limit this number, but the maximum number of bus segments allowed can be BIOS or operating system dependent. For more information, refer to KnowledgeBase 3U7CI4D8 at `ni.com`.

Notes A computer has several internal PCI bus segments. The NI PXI-8360 adds 2 PCI bus segments, and the NI PXIe-8360 adds up to 7 bus segments—4 bus segments on the backplane, and 3 bus segments internally on the NI PXIe-8360.

Due to the point-to-point nature of PCI Express, NI ExpressCard MXI supports only a star configuration. You must use traditional MXI for the daisy chain configuration.

General Cabling

What is the maximum length of an NI ExpressCard MXI copper cable?

The maximum length for an NI ExpressCard MXI copper cable is 7 m. National Instruments offers 1 m, 3 m, and 7 m copper cables.

General Software

Under which operating systems will NI ExpressCard MXI work?

NI ExpressCard MXI is a PCI-to-PCI bridge that is recognized by the majority of operating systems. It should automatically work with most systems like Windows, Macintosh OS X, Linux, and Solaris, but only Windows XP has been verified in the initial release of NI ExpressCard MXI.

Will my laptop work with NI ExpressCard MXI?

Some laptops do not support bridges behind ExpressCard slots. Refer to the NI ExpressCard MXI model page at `ni.com/pxi` for a list of compatible laptops.

What software is required to use my NI ExpressCard MXI kit?

No software is required to use NI ExpressCard MXI. However, software is included as part of your kit for Windows and LabVIEW RT. The software for your NI ExpressCard MXI controller enhances the product, allowing you to view information about the organization of your PXI system and programmatically retrieve data about the chassis and modules you have installed.

If the NI ExpressCard MXI software does not support your operating system, you can still use NI ExpressCard MXI as a PXI or PXI Express interface.

MXI-3 required optimization software. Does NI ExpressCard MXI require the same?

No. The necessary optimization is now done automatically by the NI ExpressCard MXI hardware.

How does my NI ExpressCard MXI board show up in the Windows Device Manager?

NI ExpressCard MXI boards contain two types of PCI devices onboard and will have several listings in the Windows Device Manager (WDM). The first devices show up in the WDM listed under System devices as **PCI standard PCI-to-PCI bridges**. The second device type shows up in the WDM as an **NI PXI-8360** or **NI PXIe-8360 SMBus Controller** when the correct NI ExpressCard MXI driver is installed. This second device provides configuration information for the software.

The NI PXIe-8360 has up to 7 PCI standard PCI-to-PCI bridges and one NI PXIe-8360 SMBus Controller device.

The NI PXI-8360 includes two PCI standard PCI-to-PCI bridges and one NI PXI-8360 device.

The NI ExpressCard-8360 does not include any devices that show up in the Device Manager.

If the NI ExpressCard MXI software is not installed, the PCI-to-PCI function will still be detected and work correctly, but the **NI PXI-8360** or **NI PXIe-8360 SMBus Controller** will be detected as an unknown device.

MXI-3 and MXI-4 to NI ExpressCard MXI Upgrade Questions

What are some of the improvements from MXI-3 and MXI-4 to NI ExpressCard MXI?

NI ExpressCard MXI incorporates the latest technology to include:

- Laptop control of PXI and PXI Express.
- Support for ExpressCard slots.
- Improved performance.

Can a MXI-3, MXI-4, and NI ExpressCard MXI board be used together directly?

No. MXI-3, MXI-4, and NI ExpressCard MXI boards use different cable connectors and cannot be connected together. Additionally, the board-to-board communication protocols differ.

Can I use a MXI-3, MXI-4, and NI ExpressCard MXI kit in the same multichassis PXI system?

Yes. Different MXI kits can be intermixed to connect multiple PXI chassis together. As mentioned previously, an individual MXI-3 or MXI-4 board will not cable directly to an NI ExpressCard MXI board.

MXI-3 and MXI-4 systems required the use of a specific boot ordering. Is this a requirement with NI ExpressCard MXI?

Yes. The requirements of the PCI bus still mandate that you must power on secondary PXI chassis before powering on the host PC when using NI ExpressCard MXI.

If you add more chassis using MXI-4 you may power up the chassis in any order, then power up the host laptop.

If you add more chassis using MXI-3 you must follow the MXI-3 boot order for those chassis. You must power up the chassis at the end of the chain and work your way back to the host.

For more details, refer to the *Powering Up the NI ExpressCard MXI System* section of Chapter 2, *Hardware Installation*.

C

Technical Support and Professional Services

Visit the following sections of the award-winning National Instruments Web site at ni.com for technical support and professional services:

- **Support**—Technical support resources at ni.com/support include the following:
  - **Self-Help Technical Resources**—For answers and solutions, visit ni.com/support for software drivers and updates, a searchable KnowledgeBase, product manuals, step-by-step troubleshooting wizards, thousands of example programs, tutorials, application notes, instrument drivers, and so on. Registered users also receive access to the NI Discussion Forums at ni.com/forums. NI Applications Engineers make sure every question submitted online receives an answer.
  - **Standard Service Program Membership**—This program entitles members to direct access to NI Applications Engineers via phone and email for one-to-one technical support as well as exclusive access to on demand training modules via the Services Resource Center. NI offers complementary membership for a full year after purchase, after which you may renew to continue your benefits.

    For information about other technical support options in your area, visit ni.com/services, or contact your local office at ni.com/contact.
- **Training and Certification**—Visit ni.com/training for self-paced training, eLearning virtual classrooms, interactive CDs, and Certification program information. You also can register for instructor-led, hands-on courses at locations around the world.
- **System Integration**—If you have time constraints, limited in-house technical resources, or other project challenges, National Instruments Alliance Partner members can help. To learn more, call your local NI office or visit ni.com/alliance.

- **Declaration of Conformity (DoC)**—A DoC is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting `ni.com/certification`.
- **Calibration Certificate**—If your product supports calibration, you can obtain the calibration certificate for your product at `ni.com/calibration`.

If you searched `ni.com` and could not find the answers you need, contact your local office or NI corporate headquarters. Phone numbers for our worldwide offices are listed at the front of this manual. You also can visit the Worldwide Offices section of `ni.com/niglobal` to access the branch office Web sites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

Glossary

Symbol	Prefix	Value
n	nano	10^{-9}
µ	micro	10^{-6}
m	milli	10^{-3}
k	kilo	10^{3}
M	mega	10^{6}

Symbols

°	Degrees
≥	Equal or greater than
≤	Equal or less than
%	Percent

B

bus	The group of conductors that interconnect individual circuitry in a computer. Typically, a bus is the expansion vehicle to which I/O or other devices are connected. Examples of PC buses are the AT bus, NuBus, Micro Channel, and EISA bus.
bus master	A type of a plug-in board or controller with the ability to read and write devices on the computer bus.

C

C	Celsius.
clock	Hardware component that controls timing for reading from or writing to groups.
counter/timer	A circuit that counts external pulses or clock pulses (timing).

D

device	A plug-in instrument board or pad that can contain multiple channels and conversion devices. Plug-in boards and PCMCIA cards, which connect to your computer parallel port, are examples of devices.
digital trigger	A TTL level signal having two discrete levels—a high and a low level.
DMA	Direct Memory Access—a method by which data can be transferred to/from computer memory from/to a device or memory on the bus while the processor does something else. DMA is the fastest method of transferring data to/from computer memory.

F

FPGA	Field Programmable Gate Array—a logic device that has its functionality defined after it is manufactured.

I

IEEE	Institute of Electrical and Electronics Engineers.

P

PCI	Peripheral Component Interconnect—a high-performance expansion bus architecture originally developed by Intel to replace ISA and EISA. It is achieving widespread acceptance as a standard for PCs and workstations; it offers a theoretical maximum transfer rate of 132 Mbytes/s.
PCI-PCI bridge	A device that transparently expands the PCI bus on a computer motherboard to another bus segment in the same machine. The bridge expands the number of PCI expansion slots, but remains transparent to the end user.
PCI Express	A scalable full-simplex serial bus standard that operates at 2.5 Gbps and offers both asynchronous and isochronous data transfers.
PXI	PCI eXtensions for Instrumentation. PXI is an open specification that builds off the CompactPCI specification by adding instrumentation-specific features.

X

x1 A link or port with one physical lane.

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